NORTHROP GRUMMAN
DEFINING THE FUTURE
Integrated Systems
19 November
2003
Targets:
The Multi-Mission
UAVs
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BQM-34 / BQM-74E Program Manager

Old View

"There Are Only Two Kinds of Airplanes: Fighters and Targets."

-- Anonymous Fighter Pilot

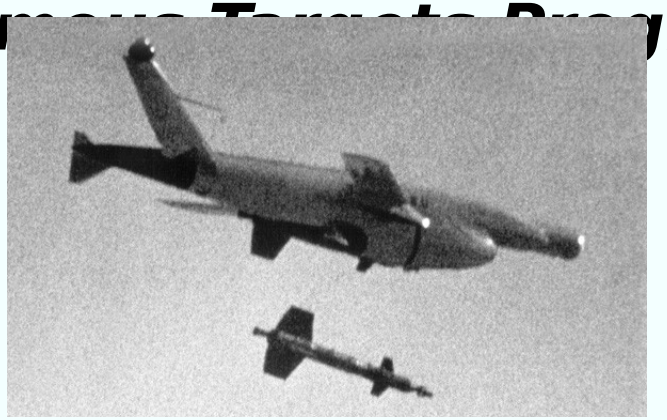
New Views

"There Are Only Two Kinds of Airplanes: Manned and Unmanned. And with the Unmanned You Don't Have to Put Up With Fighter Pilots."

-- Anonymous Commander

"Targets Are UAVs. UAVs with Weapons Are UCAVs. Be Nice or I'll Arm My Targets and Start Shooting Back."

-- Anonymous Targets Program Manager



The Point...?

- Targets Are Proven UAVs
  - Sophisticated
  - Reliable
  - Versatile
  - Cost Effective

- Mission Is Strictly a Matter of Payload
- Targets Were Designed to Replicate Aerial Threats
  - Can Perform Many of the Same Missions

Targets Are A Readily Available Multi-Mission Resource

Targets Presentation Overview

- **Evolution as First Successful UAVs**
- **Expansion of Capabilities**
- **Future Opportunities**

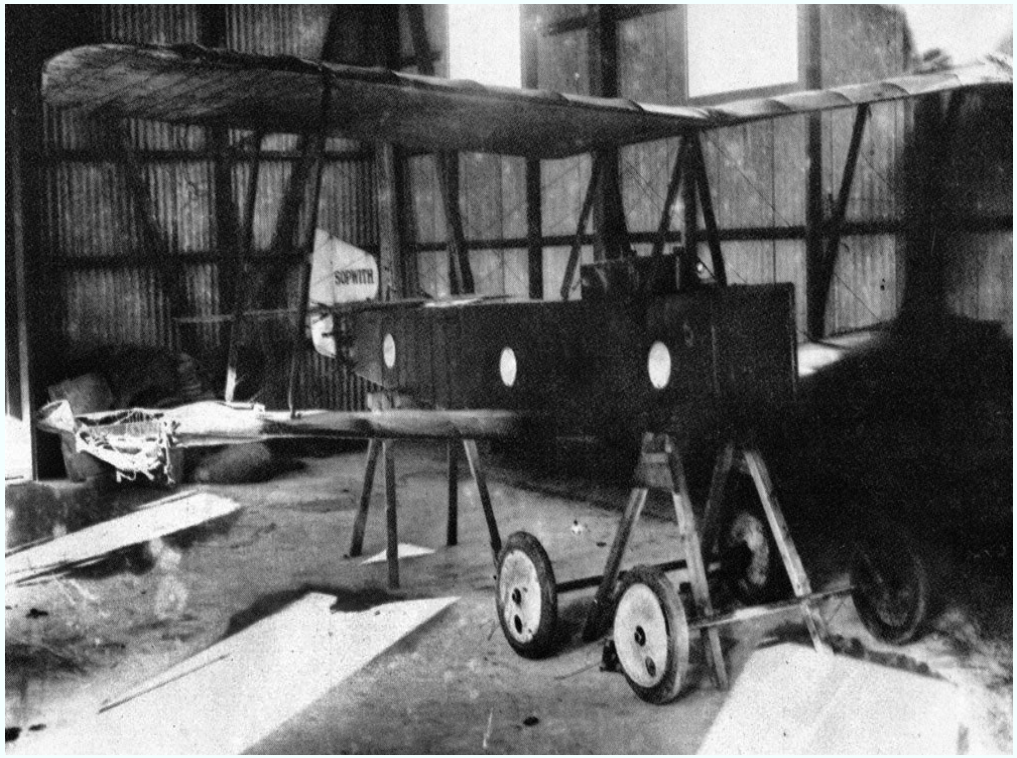
Curtiss N2C-2

BGM-34B Pathfinder with Laser Designator and

Tomorrow's Target?

The First UAV Was An "Aerial Target" . . . That Wasn't A Target!

- **Intended to Be a Weapon**
  - **Pilotless, Radio-Controlled Aircraft for Air Intercept and Ground Attack**
  - **Designated *AT* (for "Air Target") to Mask Mission As "Aerial Torpedo"**



Sopwith AT (1916)

First Real Aerial Targets

- **Need Grew Out of WW I "Threat from the Skies"**
- **Military Requirement to Counter New Challenges**
  - **Test Weapons, Tactics, and Procedures**
  - **Train Defenders**
- **First Successful Radio-Controlled Flight Made by RAE *Target* (1923)**
- **First Actual Targets Were Fairey IIIF Floatplanes with Radio Control Equipment**
- **First Production Target Was deHavilland *Queen Bee***

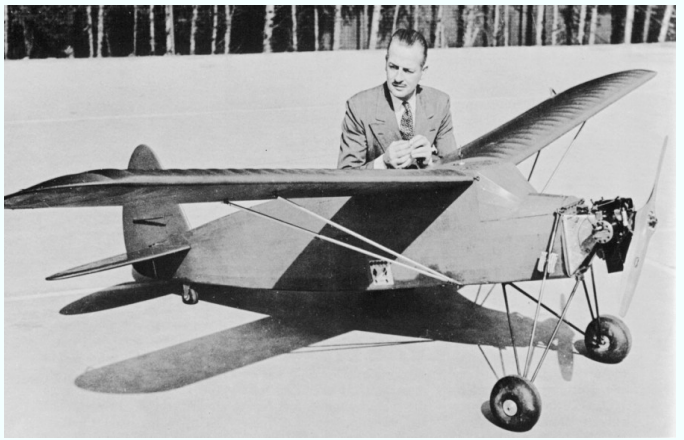
Fairey IIIF (1932)

Controlling deHavilland Queen Bee (1935-42)

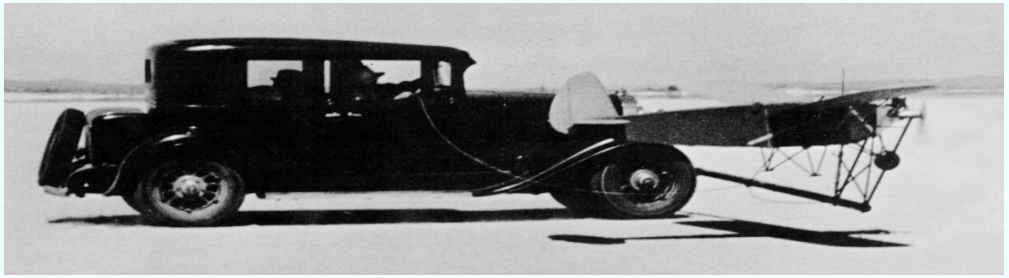
Early American Targets Experience

- **Navy Spearheaded US Target Developments**
  - **Successes with Radio-Controlled N-9 Seaplane (1924)**
  - **First American Aerial Targets Used for Fleet Training (1938)**
- **Early Subscale Work Pioneered by Model Plane Enthusiast/Actor Reginald Denny**
  - **RAF Aerial Gunner in WW I**
  - **Demonstrated RP-1 to US Army**
- **Founded Radioplane with Others Following Successful Demo of RP-4**

Curtiss N-9 Seaplane



Denny With RP-1 (1935)



RP-4 Being Launched from Car (1939)

Further Developments In "Unmanning" Aircraft

- **Success in Radio Control of Aircraft as Targets During 1930s Spurred Renewed Efforts to Develop Controllable Aerial Bombs**
  - **USN *Project Option* (1942-44)**
  - **USAAF *Operation Aphrodite* (1944-45)**

- **But Other Unmanned Applications Also Emerged**
  - **Navy Began Evaluating Remote Control of Flight Test Aircraft to Eliminate Pilot Risk (1939)**
  - **Pilotless P-61s Used to Penetrate Thunderstorms for Meteorological Data Collection (1946)**
  - **Automated QB-17s and F6F *Hellcats* Used in *Operation Crossroads* Bikini Atomic Tests (1946-58)**

USN TDR-1 Assault Drone

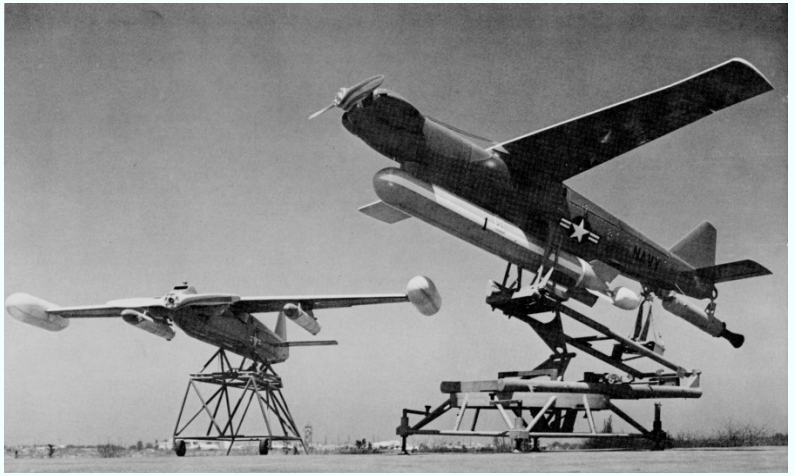
Unmanned F6F and QB-17 (July 1946)

Morphing of Targets Into Multi-Mission UAVs

OQ-19 Target Modified to Support Multiple Missions

SD-1 Observer – Tactical Reconnaissance (1955)

KD-2R with Air Sampling Pods (1961)



KD-2R Torpedo Carrier (1961)

Continuing Developments

- **Award of Contracts in 1948 for First Jet-Powered Targets Guaranteed Further Efforts to Use Targets for Non-Target Applications**
  - **Radioplane Q-1 (Forerunner of BQM-74)**
  - **Ryan Q-2 (Forerunner of BQM-34)**

- **Multiple Variant Target Applications Proposed During the 1950s/1960s**
  - **Redesigned YQ-1B Tested as Anti-Radiation Missile in 1954**
    - **RP-54D (GAM-67, *Crossbow*)**
  - **Modified BQM-34 Firebee Ground-Launched with 1000-Lb Weapon Load in Army Tests in 1964**
    - **Extended Wing Tips and ASROC Booster**

GAM-67 on B-47

BQM/SSM in Launch Test

Targets At War In The '60s And '70s

- **Descendants of the Original *Firebee* Include 28 Variants Used for Non-Target Applications**
  - **High-Altitude Photorecce (1964)**
    - **ELINT Collection (1965)**
      - **Expendable Decoy (1966)**
        - **Low-Altitude Day/Night Photorecce (1967)**
      - **Chaff Dispensing and Active ECM (1968)**
    - **Data Linked COMINT (1970)**
    - **Leaflet Dropping (1972)**
    - **LORAN Navigation (1972)**
    - **Data Linked TV (1972)**
    - **Data Linked Photo Relay (1974)**
- **Vietnam Era: Variants Conducted Over 3400 Asian Recce Missions**
  - **Routes Up to 1400 NM**

AQM-34 Variants at U-Tapao AB, Thailand

68-Mission "Tom Cat" AQM-34 SPA

Weaponization

- Firebee BQM/SSM System Tested Successfully for Navy (1971)
- BGM-34A Developed for SEAD
  - Concept Tests Followed by Target "First": Successful Delivery of Weapon (1972)
- BGM-34B Expanded Capabilities
  - Successfully Used to Deliver Mavericks, Hobos, etc. in AF Tests (1973-74)
- BGM-34C Combined EW, Recce, Strike
  - Demonstrated Successfully 1976-78)

BGM-34B with Self-Propelled Air-to-Surface Munition (SPASM)

BGM-34C with Configuration Options

BGM-34Bs At Hill AFB In Early 1970s

Targets At War Again In The Modern Era

- **BQM-74Es Used To Saturate Enemy Air Defenses during Opening Days of 1991 Gulf War**
  - **Over 40 Air Vehicles Modified on Short Notice and Deployed to Theater**
  - **Task: Deceive/Disrupt Air Defense Network**
  - **Flown in 3-Ship and 4-Ship Formations to Replicate Incoming Bomber Strikes**
  - **Used in Coordination with TLAMs and Wild Weasel SEAD Aircraft with Great Effectiveness**

Operations During Desert Storm

Extended-Range BQM-34 Development

- **Tests in 2002 Demonstrated Ability to Deliver Payloads At 400 NM Range**
  - **Ground Launch from Remote Facility**
  - **Autonomous Mission Flown at High and Low Altitude Using GPS Waypoint Navigation**
  - **Precision "Soft" Delivery of 85-Lb Payload**

- **Air Vehicle Modifications Performed In-House**
- **Led Directly to Request for OIF Support**

BQM-34-53 Test Launch with Payload Pod

Operation Iraqi Freedom

- **Air Force Requirement**
  - **Convert Standard BQM-34 Firebee Targets to Fully Autonomous Air and/or Ground Launched Air Vehicles**
  - **Deploy to Meet Operational Timetable**
- **Purpose**
  - **Perform Missions During OIF**
- **Result**
  - **Support of Army, Navy, and Air Force Targets Program Personnel Enabled NGC to Complete Mods and Deploy within 17 Days of Go-ahead**
  - **All Vehicles Performed As Planned**
  - ***Highly Successful Operation***

Palmdale Day 0

Ready for Ops Day 17

Members of Targets Community Enjoy Strong, Effective Partnership

BQM-34 Firebee Special Request – SOW

- **Combined Complementary Features of Air Force and Navy Firebees to Meet Unique Mission Requirements**
  - **Software Modifications**
    - **Air Launch Capability**
    - **Payload Control Capability**
    - **Autonomous Mission Control**
    - **Waypoint Navigation**
  - **Removed Command & Control Hardware**
  - **Installed Dual Service-Unique Payloads**
  - **Engine Igniters Configured to Support Either Air or Ground Launch**
  - **“Keep Alive” Circuit Installed to Enhance Air Launch GPS Reliability**
  - **Provisioned to Support External GPS Signal Input**
  - **Tactical Paint Job**

Special Mission Vehicles

Navy DC-130A and Crew Supported USAF Mission Needs

- **Proven Targets Offer Readily Available Special Mission Vehicle Capability**

- **17 Days Start to Delivery**
- **Fully Autonomous UAV**
- **All Missions Complete**
- **Numerous Vehicles**

Iraqi Television Image of "Downed Aggressor"

Lessons Learned .Over and Over Again

- Targets Are Effective, Multi-Role UAVs
  - Excellent Utility in Joint Operations
- Cooperative Partnership Between Military and Commercial Targets Specialists Makes It Possible to Accomplish Tough Missions in Timely Manner
- Targets Providers Can Respond Quickly to Diverse Requirements
  - Agile Contracting
  - Quick-Reaction Engineering
  - Corporate Commitment

Target Multi-Mission Versatility Remains Relevant

Multi-Role Benefits

- **Operational Missions Can Continue to Benefit From Target Systems and Technologies**
  - **Mature Platforms**
    - **Reliable**
    - **Modular with Diverse Payload Capacity**
    - **Broad Range of Performance Options**
    - **Tri-Service**
    - **Air, Ground, and Sea Launch Capable**
  - **Mature Technologies**
    - **Autonomous Navigation**
    - **Flexible Command and Control**
  - **Mature Support Structures**
  - **Diplomatic Advantages**
  - **Eliminate Human Exposure**

Mature = Low Risk / Low Cost

Future Opportunities

- **Military and Commercial**
  - **Surrogate UCAV Technology Demonstrator**
    - **Command & Control**
    - **Weapons & Tactics Integration**
    - **Sensors and Payload Test Bed**
    - **Aircraft Systems Developmental Test Platform**
    - **Multiple Weapons**
  - **Flying Test Bed**
    - **Equipment and Systems (Internal, External, and Off-Board)**
    - **Tactics, Techniques, Procedures**
  - **Low-Cost Systems Verification**

UMS
Unmanned Systems

NORTHROP GRUMMAN

Integrated Systems

DEFINING THE FUTURE

Backup